In making the observations, the aneroid barometer was placed on a tripod, two feet distant from, and the same elevation given it as, the cistern of the mercurial barometer. It is intended to investigate further next summer the effects of wind gusts upon barometric pressure at this station by other and somewhat different observations, and it is believed interesting data will be secured.

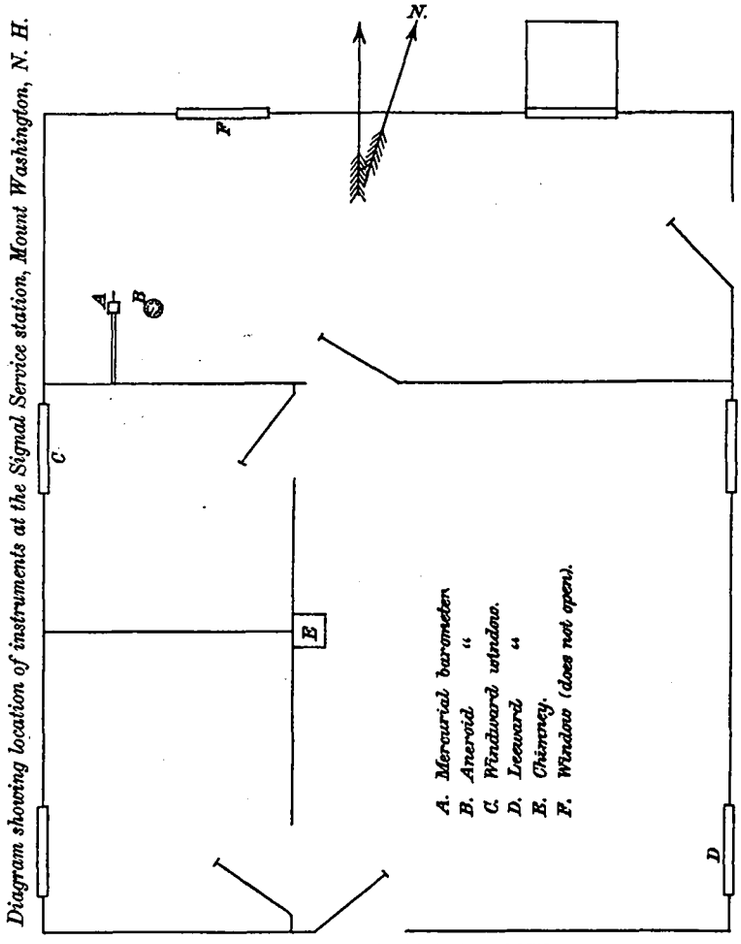

Diagram showing location of instruments at the Signal Service station, Mount Washington, N. H.

KRAKATOA SMOKE AND THE SKY-GLOWS.

[By Junior Prof. H. A. Hazen.]

Professor Kiessling, of Hamburg, has recently published an important paper on this subject (*see* Sitzungsber der Kgl. Preuss. Akad. d. Wiss. zu Berlin, p. 529, 1886). Perhaps the most significant part of the paper is a partial denial of the commonly-held view that the remarkable sky-glows, beginning in the latter part of August, 1883, were due to the effect of fine volcanic ashes thrown into the upper atmospheric layers by the very violent outburst of Krakatoa on August 27, 1883. Professor Keissling writes: "It is easy to show that air which is full of extremely fine dust, or artificially ground Krakatoa dust, has very little influence in the development of homogeneous clouds, or clouds consisting of uniform water-drops, in comparison with the powerful cloud-forming action which comes from such gases of combustion as are beyond direct optical observation."

Granting that it is possible to infer from the results of a laboratory experiment what may be the probable action of similar forces in nature's vastly greater laboratory, it is gratifying to see that Professor Kiessling has abandoned the theory of the sufficiency of Krakatoa ashes to produce the sky-glows, which is beset with insurmountable difficulties. It would seem, however, that in attributing the same effect to the smoke of the volcano, he has introduced difficulties far more serious than any to be met in the original view. The following are a few of the more serious objections to the theory that the sky-glows were caused by Krakatoa smoke or gases.

1st. If any one will project the various first appearances of the glows upon a map he will find that, even after making due allowance for lack of records, for non-uniformity in the scale of intensity, etc., it is still impossible to connect them by any reasonable hypothesis with smoke clouds coming from Krakatoa.

2d. The facts require that there be two currents in the upper atmosphere, starting from Krakatoa, and running in opposite directions at a velocity about forty metres per second (eighty-nine miles per hour). This is clearly impossible.

3d. There is unquestioned evidence that the movement of the upper atmosphere is from west to east, which is contrary to the movement of the bulk of the supposed Krakatoa smoke current.

4th. No velocity even approximating to forty metres per second, can be admitted. The highest average August velocity on Pike's Peak, which is more than 2,500 miles north of the equator, and 14,134 feet above sea-level, is ten metres per second, and on the highest mountains near the equator, where we have observations, it is somewhat less than that. The motion of the highest cirrus clouds is from the west, and, while in the neighborhood of storms, there have been estimated velocities of forty metres, per second, for a short time, yet it is highly probable that the average velocity in the summer season is not over ten metres, per seoond. Professor Kiessling cites Prof. W. Siemens as authority for the theory that the earth rotates on its axis without carrying the upper air strata with it. It may be safely said that this theory is utterly untenable.

5th. That the sky-glows were largely dependent on meteorological conditions was very apparent in the higher latitudes. They were only seen in perfection in the evening, when there was a marked area of high pressure to the west. It was frequently remarked that on some clear nights, when the conditions appeared favorable for the manifestation, provided it was dependent upon a cloud of smoke. there were no glows to be seen.

6th. It is highly probable that no possible velocity of propulsion could carry smoke or gas to anything like the height needed for explaining the phenomena, but granting that this smoke reached the higher regions of the atmosphere, say twenty kilometres (nearly thirteen miles), it will be admitted, I think, that it would be diffused throughout the whole upper regions with a velocity approaching that of sound, and in a few seconds the resulting density would be altogether too slight to produce any marked effect on the sun's light. This last consideration shows how utterly wide of the mark is the theory that there could be anything approaching even a *cloud* of this smoke.

There are many other objections to the theory that these glows could have been produced by any direct ejecta from Krakatoa, but the above views are sufficient to show its great weakness. There seems to be a gradual settling down of meteorologists to the view that the glows were an extraordinary intensification of ordinary sunrise and sunset phenomena, which we know are due to the presence of water or ice particles in the atmosphere. It is probable that an unusual electrical activity, possibly concomitant with the Kraktoa outburst, was in part needed, and, in addition, it was necessary that the meteorological conditions be favorable. A combination of all these elements would produce the glow in all its intensity, and an absence or diminution of any one or more would give a less effect.

The following table, furnished by Capt. M. W. Wood, Assistant Surgeon, U. S. Army, and forwarded by 2d Lieut. D. L. Brainard, 2d Cavalry, U. S. Army, is a recapitulation, by months, of meteorological data observed at Fort McPherson, Nebraska, from 1870 to 1878, inclusive. The force of wind is estimated on a scale of 1 to 10, counting 1 for a light breeze and 10 for a gale of fifty miles per hour:

From 1870 to 1878.	Temperature.								Precipitation.							
	Highest maximum.	Lowest minimum.	Highest monthly range.	Lowest monthly range.	Average monthly range.	Highest monthly mean.	Lowest monthly mean.	Average monthly mean.	Mean No. of days on which rain or hail fell.	Mean No. of days on which snow fell.	Total No. of days on which rain, hail, or snow fell.	Highest precipitation.	Lowest precipitation.	Average precipitation.	Total for eight years.	Average force of wind.
	°	°	°	°	°	°	°	°				*In.*	*In.*	*In.*	*In.*	
January	78	—30	84	64	74.2	33.2	7.7	23.8	0.5	4.1	37	1.28	0.02	0.31	2.48	2.6
February	78	—24	86	53	70.4	38.7	18.6	31.4	1.1	3.5	37	0.45	0.08	0.23	1.85	2.4
March	83	— 4	84	67	75.4	46.7	33.4	38.1	1.6	3.9	45	2.25	0.07	0.92	7.38	2.9
April	96	5	97	65	75.2	53.8	44.2	46.7	4.6	2.4	56	4.72	0.34	2.30	18.46	3.1
May	96	25	65	55	61.2	65.5	56.7	58.8	10.1	.....	81	8.41	1.82	3.84	30.71	2.8
June	104	33	66	52	59.4	78.9	67.7	72.6	7.9	.....	63	8.56	0.64	3.08	24.68	2.7
July	115	35	80	49	59.2	83.3	74.4	77.6	9.1	.....	73	4.22	0.74	2.63	21.04	2.5
August	110	36	74	51	59.8	80.8	71.1	75.2	7.4	.....	59	3.12	0.48	1.76	14.13	2.4
September	102	19	79	60	69.1	66.7	62.2	64.5	6.9	.....	55	5.48	1.06	2.14	17.17	2.5
October	100	6	91	60	73.9	55.7	47.1	52.4	2.0	1.1	25	1.96	0.01	0.54	4.35	2.3
November	80	—12	84	64	74.6	46.2	32.0	35.8	1.4	2.0	27	2.84	0.00	0.52	4.18	2.5
December	74	—20	90	58	72.2	35.9	19.2	26.7	0.9	3.6	36	3.20	0.10	0.64	5.16	2.1
For eight years	115	—30	97	49	68.7	83.3	7.7	50.3	.....	.....	594	8.56	0.00	1.58	151.59	2.6